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Order. *Coniferæ.*

Section. *Abietinæ.* Richard.

Before we proceed to describe such individuals belonging to this division of the *Coniferæ* as are admissible within the limits of the present work, either as being indigenous to the kingdom, or introduced and naturalized for a period sufficient to prove the quality and utility of their timber, as well as their adaptation for extensive cultivation in a British climate, a few observations on the tribe in general may not be deemed out of place, considering the interest created by the peculiarities which distinguish it in so many striking particulars from the other orders of trees, and the great importance attached to the timber of so many of its members for its valuable qualities, by the inhabitants of various parts of the globe.

The section of the *Abietinæ* consists of that portion of the *Coniferæ* or cone-bearing trees, generally known by the designation of firs, all of which, with the exception of the genus *Larix*, have their leaves persistent for more than a year, or are what are called evergreens. As a group they are distinguished from trees of other orders, as well as from the *Cupressinæ*, another section belonging to their own, by the linear or needle-like shape, and the stiff coriaceous substance of their leaves,* composed like those of the monocotyledons of parallel fibres without any lateral nerves, by the verticillate growth of their frond-like branches, which clothe them from the base to the summit, giving them a regular pyramidal or cone-like form, which holds good in all the species for a certain period of their existence, and by some is retained during the whole of it, as we see exhibited in the modern genera, *Abies*, *Picea*, *Larix*, &c., while others, as most of the genus *Pinus*, and genus *Cedrus*, at an advanced age lose this peculiar character, in consequence of the gradual decay and falling off of the lower branches, and their summits becoming rounded or flattened by the lateral extension and increase of the upper branches. The stature of the species, generally speaking, is lofty, sometimes attaining a very extraordinary height, the trunk straight and erect, and in all those firs which retain the pyramidal form during life, beautifully tapered from the base to the summit. The branches of these, we may add, always continue small and slender, in proportion to the bulk of the trunk, and have aptly been compared to immense leaves, and are one of the circumstances which seem to assimilate and connect the firs with the palms. The increase, or annual growth of the *Abietinæ*, is chiefly, and in certain species, entirely effected by shoots which proceed from terminal buds; for axillary buds, and such as are found at the base of the leaves of other orders of trees, are comparatively very rare. In genus *Pinus* they are scarcely ever seen, in *Abies* and *Picea* a few are met with, in *Cedrus* they are rather more abundant, and in *Larix* more numerous than in any other.

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* In the larch they are of a less coriaceous nature, consequently decompose more rapidly when shed, and are more fertilizing to the ground beneath.

The buds are protected in their embryo or dormant state by numerous scales, which are sometimes varnished with a resinous coat; these are thrown off when vegetation becomes active, and the shoots proceed towards their developement, a process which commences at the lower part of the tree, and proceeds regularly upwards, the leading shoot produced from the topmost bud, being the last to be developed.

The leaves, as already stated, are linear, acicular, and persistent,* in some species remaining for many years upon the tree; they vary also in their disposition, in some being single, and placed in horizontal rows along the branches, or what is termed pectinate, as seen in the silver fir *(Picea pectinata)*; in others, as the spruce fir *(Abies excelsa)*, they stand in different directions around the branch; in others, again, they are placed in bundles, enclosed in a common sheath, varying from two to six in number, and these different arrangements of the leaves, as might be expected, have been seized upon by botanists to facilitate the sectional and generic divisions of the group. In genus *Pinus* the leaves are in bundles, and much longer than in those genera in which they are single, such as *Abies*, *Picea*, &c. In *Cedrus* and *Larix*, however, though many of the leaves spring in a tufted manner from the lateral buds or diminutive branchlets, they are not, correctly speaking, in bundles like those of the true Pines, as they have no common enveloping sheath, but are placed singly, as a close examination of these buds, as well as the leaves of a leading or extended shoot of either tree, will clearly show. The longest-leaved species of genus *Pinus* are such as grow in the warmest temperature; thus, the leaves of the *Pinus Australis*, Michaux, are from a foot to a foot and a half in length, and again those of the *Pinus pinaster*, and some of its near allies, are from six to nine inches long, while those of *Pinus sylvestris* or Scotch Fir, which reaches a much higher latitude, and in mountainous countries grows in a more elevated zone, seldom exceed two inches and a half in length. In the genera *Abies*, *Picea*, &c., few have them longer than half an inch.

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* In the southern Pines we have exceptions in genera *Cunninghamia* and *Dammara*; in the first they are lanceolate, in the second oblong.

The *Abietinæ*, with the exception, perhaps, of genus *Araucaria*, are monœcious, but the male and female catkins differ greatly from each other in appearance. In those of the male, the flower consists of a number of stamens, accompanied by scales, but without any floral envelope; they are always much more numerous than those of the other sex, and the discharge of pollen when they burst is remarkably abundant. In the female the fruit forms a cone, varying in size in different species, in some being not more than half an inch long, in others upwards of a foot; the flowers consist of a stigma, enclosed in a simple calyx or perianth, and accompanied by an involucrum, composed, in most genera, of two scales, the exterior of which is large and thick, the interior, which springs from the base of the other, is thin, and protects two flowers, which afterwards appear as winged seeds. In some the exterior scales are thick, hard, and adhere close together, as seen in *Pinus pinaster*, *Pinus pinea*, &c. In genus *Abies*, again, they are loose, and of a soft leathery texture; from such the seeds are easily extracted, but those of a hard woody substance require to be forced open, or else subjected to a considerable heat, to cause the scales to expand and allow the seeds to fall out; this we see naturally effected in the cones of the common Pine, *Pinus sylvestris*, by the heat of the sun in the spring and early summer months. In some the cones arrive at maturity and shed their seed in six or eight months, in others they remain two, three, or four years upon the trees, and upon *Pinus pungens* as long as ten or twenty years. In some they stand erect, in others they hang with the apex downwards from the branches. The kernel of the seeds is composed of a farinaceous substance, mixed, according to the species, with more or less of a terebinthinate matter; they are of a wholesome and nutritive quality, and the largest kinds, such as the nuts of *Pinus pinea* and those of the *Araucaria*, are freely eaten and highly esteemed in those countries which produce them. In most species the seeds are polycotyledonous, as we observe them in the seedlings of the *Pinus sylvestris*, in which they vary from five to nine; in the larch, *L. Europea*, they are from five to seven; in *Abies excelsa* from three to nine; and in *Cedrus Libani* from nine to eleven.

The wood of the *Abietinæ* differs from that of dicotyledonous trees in being chiefly composed of parallel fibres, a structure that gives it great elasticity; it is also light, but at the same time strong, and from its resinous nature is, generally speaking, durable, particularly so in the larch and cedar, which bear exposure to the vicissitudes of the weather with as little injury as the timber of the most enduring deciduous tree.

The wood of the *Abietinæ* is, therefore, in universal use throughout the civilized world for almost all the purposes of civil architecture; and as no other order furnishes timber of the same length, and at the same time so straight and so regularly tapered, it is from the forests of this tribe that the masts, yards, &c., of ships, are almost wholly procured. It is also from the *Abietinæ* that so many of our useful resinous products are obtained, such as the various turpentines, resin, colophony, &c. Tar also is another important substance, obtained by charring the wood, during which process the tar flows from it in the form of a thick black fluid, which is collected in reservoirs or casks made to receive it.

The geographical distribution of this section of the *Coniferæ* is very extensive, but the great majority of the species are found in the temperate parts of the northern hemisphere; some species extend to high latitudes, reaching nearly to the icy regions of the arctic circle, or if growing in temperate and warmer districts, inhabiting the mountains, where they occupy a zone so elevated as to reduce the climate to the degree of temperature equivalent to that of a higher latitude. Even the few species which grow within the tropics are always found in localities rendered comparatively cool, either by their elevation, or their proximity to the sea. The social nature of the *Abietinæ* is shown by the vast forests which cover extensive tracts of country, to the exclusion of almost every other tree. These prevail throughout all the northern parts of Europe, consisting sometimes of the common Pine, *Pinus sylvestris*, which is also the indigenous fir of Scotland, where it still occupies extensive districts; at others, of the spruce, *Abies excelsa.* In parts of Germany the *Pinus Austriaca* is the prevalent species; in others, *Pinus pallasiana.* In the Swiss and the Tyrol Alps the larch abounds, as well as the *Picea pectinata*, perhaps the finest of the European firs. In North America, also, enormous tracts of country are wholly occupied by forests of *Abietinæ*, among which those of the *Pinus strobus*, Weymouth Pine, which furnishes the white deal of commerce, and is largely imported into Britain from our Canadian provinces, are, perhaps, the most extensive. In Asia, the great chain of the lofty Himalayas, and the mountains of Nepaul, afford appropriate zones for the growth of forests of firs and cedars, and from these remote districts we are almost annually receiving the seeds of new and important species, many of which, there is reason to suppose, may be acclimated in this country, and become important additions to our list of *Coniferæ.*

The soil upon which most of the *Abietinæ* prevail, is usually of a dry and cool quality; thus, the *débris* of granitic and other primitive rocks, and barren sandy districts, are very commonly occupied by Pine and fir forests, sometimes of enormous extent; the thick and close manner in which they grow, and the dense shade they produce, effectually preventing the vegetation of other species. Matthew, however, in his able treatise on naval timber seems to think that its indigenous location in such districts arises not so much from preference of soils of the nature abovementioned, as from its having more power of occupancy in such soils than any other plant of the country; and this opinion he endeavours to support by stating that the *Pinus sylvestris*, planted in a good or rich soil, attains larger dimensions and its best timber properties, and that it is only driven from this superior soil by the greater power of occupancy possessed by the oak and other deciduous trees, an opinion in which we cannot altogether acquiesce, as we see no reason why the fir, if it grows with such additional vigour in a richer soil, as Mr. Matthew asserts, should, at the same time, be unable to maintain a contest with the oak or other trees.

Of late years, the cultivation of the *Abietinæ* has been a favourite pursuit with arboriculturists, and many new species have been introduced from the south-east of Europe, from Asia, and North America, particularly from the north-west part of that Continent. Several of these, from their rapid growth, the excellent quality of their timber as tested in their native regions, and their apparent adaptation to our climate, promise hereafter to be highly advantageous and of great national importance, while others, though affording a timber of less value, are, nevertheless, deserving at least of limited culture for the beauty and symmetry of their form and the ornamental effect they produce. Pinetums, or collections of the *Abietinæ* planted by themselves, are now numerous throughout the kingdom, and have become an object of great interest to dendrologists. Among the first established and in which the trees have now arrived at a considerable size, is that at Dropmore, near Windsor, formed by the late Lord Granville in 1810. In Bedfordshire, at Flitwick House, the seat of T. Brooks, Esq., the Pinetum is rich in species. In Cornwall, at Carclew, that of Sir J. Lemon is also very extensive. In Northumberland, the first established and richest Pinetum is that of Sir C. L. M. Monck, Bart., at Belsay Castle, but others have since been formed, among which we may mention one at Howick Hall, the seat of Earl Grey, which we lately inspected, and where we found many of the rarer kinds growing very luxuriantly. In Scotland, also, several Pinetums have been formed, some of which are rich in species, and in others they grow with a luxuriance which shows the soil to be congenial and adapted to their habit.

Much, however, as we admire Pinetums, and glad as we are to see them encouraged and becoming more numerous throughout the kingdom, we are still more anxious that the culture of the *Abietinæ* should not be confined to the restricted limits of the portion of ground set apart for this particular purpose, but that further experiments should be generally made by large landed proprietors, to ascertain,

—by planting the different species introduced, in a variety of soils and situations and at different elevations, where they are likely to grow most vigorously and soonest to turn to profitable account,—facts which we can scarcely expect to determine from examples grown in Pinetums, where the soil and local situation can scarcely be supposed to be suitable to all the different species assembled within their bounds. Such a plan we are now pursuing upon a limited scale, and we strongly recommend its adoption by those who possess extensive estates, which afford a variety of surface and soils of various quality, more particularly directing their attention to those species which, in their own regions, evince a hardihood of constitution and yield a valuable timber, among which we may particularize the *Pinus uncinata* of Captain Widdrington, *P. Hispanica*, *P. Austriaca*, *P. Pallassiana*, *Abies Douglassii*, and *Cedrus deodara*, which, by some, is expected hereafter to rival the larch in national importance.

Independent of the value of the *Abietinæ* for the excellent timber they produce, most of the species, as ornamental objects alone, are well deserving of culture, no tribe of plants exhibiting greater individual beauty from their earliest age, either in point of symmetry or regularity of form, added to which they have the advantage of being evergreen, and in many cases attain a stature loftier than most of our deciduous trees. As ornamental objects, however, they require a treatment very different from that which they ought to receive when grown in mass with a view to timber or profit, as, instead of being planted near to each other or to other trees, and kept in pretty close contact for several years, in order to promote the early decay of the lower branches, whereby a clean trunk, devoid of knots, can alone be ensured, they should, from the earliest age, have ample room on every side, nor should any other plant be suffered to interfere with the growth of the lower branches, as upon the retention of these, which are so essential to the perfect pyramidal form of the true firs, their beauty and elegance chiefly depend. The propagation of the *Abietinæ*, upon an extensive scale, can only be effected by seeds, which, however, are produced in abundance by most species after they attain a certain age, by a succession of cones which are a longer or a shorter time in arriving at maturity, in some kinds several years being required to ripen the seed contained, whilst in others this is effected in the course of a few months. Most of the species may also be increased by layers or by cuttings, a mode of propagation known in the time of Evelyn, who mentions it as a "considerable secret." Inarching on closely allied species has also been successfully practised; and, within the last thirty or forty years, what is called herbaceous grafting, —an operation we shall afterwards have occasion to speak of more in detail,—seems to be the most approved mode of artificially increasing species lately introduced and which have not yet reached a cone-bearing age. Upon the culture and management of the *Abietinæ* in general we conclude our remarks for the present, reserving further observation on these subjects till we enter upon the particular descriptions of the different species admitted within the limits of our work, and we shall also leave to the same opportunity our observations on the various diseases, accidents, &c. to which they are subject, as well as an enumeration of the insects by which they are infested or attacked.

Genus *Pinus*, Linn.

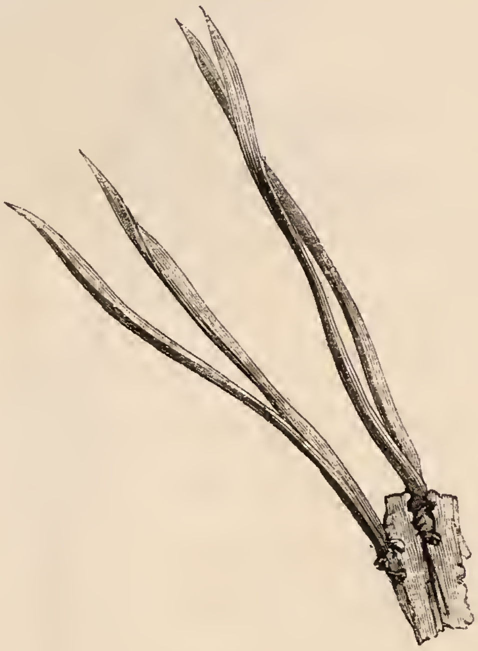
Linn. *Syst. Monœcia*
Monodelphia.

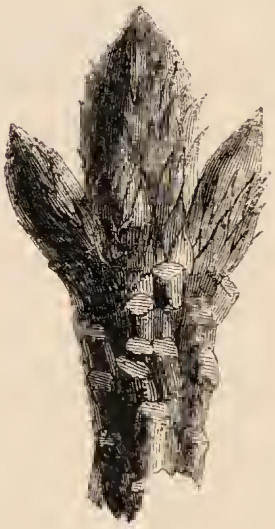
Pinus sylvestris.

THE PINE.

Pinus sylvestris, Linn. sp. pl. 1418.
Hunt. Evel. Sylv. i. p. 274.
Smith's Flor. Brit. t. 1031. Id. Eng. Flor. iv. p. 159.
Hooker's Flor. Scot. 275.
Lamb. Pin. ed. fol. i. t. 1.
Mackay's Flor. Hibern. p. 258.

The specific characters of this species, as given by Sir J. E. Smith, are, leaves rigid, in pairs, the young cones stalked and recurved, crest of the anthers very small. As additional characteristics, we may remark that the leaves are from one inch and a half to upwards of two inches long, slightly waved or twisted, the upper surface concave, the under convex, of a glaucous green-colour. The sheath which incloses them at the base is winged and uneven on the edge. The terminal buds, which are found at the ends of each year's shoots, and consist of a central and from four to six smaller side buds around it, are oval and blunt-pointed, clothed with reddish chaffy scales, which are more or less varnished at the base with a white resinous exudation, and, in the winter or during the dormant season, are from a quarter to half an inch long. The male flowers or catkins, when in bloom, are from half an inch to upwards of an inch long, and are placed in whorls at the base of the young shoots of the current year; the flowers contain two or more stamens with large yellow anthers, which discharge a sulphur-coloured pollen in great





abundance. The embryo cones or female flowers appear on the summits of the shoots of the year, in number from two to as many as six, and of a green or purplish green colour. When impregnated, they become lateral and reflexed, and cease to increase in size till the following spring, when they again begin to swell, and by July attain their full size, ripening by degrees into ovate, pointed, and tesselated, hard woody cones, from one inch and a half to two inches long. These remain on the tree for a considerable time afterwards, though the seeds are discharged the following spring, and it is then that trees are frequently seen with cones in four different stages: viz., in the youngest or embryo state; in an unripe or green condition, but of full size; in a matured state, or when they have become brown; and lastly with the scales expanded after the seed has been shed. The scales of the cones are oblong and terminate externally in a kind of depressed pyramid, which varies considerably in shape and height; in some this part of the scale is considerably raised and pointed, in others the summit of the pyramid is bent to one side, or turns downwards in the shape of

a blunt hook or prickle, and again, in others, it is almost smooth or with the summit depressed and sunk. At the base of each scale and close to the axis of the cone two seeds or nuts are lodged, each with a large membranaceous wing, which encircles, but is not directly attached to, them. From these nuts the young plant appears in the shape of a slender stem, with from five to six linear leaves or cotyledons.

In trees which have had sufficient space from an early age the trunk is generally furnished with branches from within a short distance of the ground; but in forests, or when grown in thick masses, the lower branches decay and fall off, in consequence of the want of room and air, and a clean naked trunk, of great length, is the result. The branches, as may be supposed from the disposition of the buds, are in whorls; when young they turn slightly upwards, but, as they elongate, they take a horizontal direction, and in old trees finally become somewhat pendent. The bark is of a fine reddish brown, in some varieties deeply furrowed, in others nearly smooth and scaling off in patches. In favourable situations the Wild Pine often attains a height of eighty or one hundred feet, with a trunk from two to four feet in diameter.

In whatever light we view the Common Pine, whether in relation to its distribution over so large a surface of the globe, its value as a timber in most extensive use in civil as well as in naval architecture, or to its individual form and aspect as a vegetable production, we may safely affirm it to be one of the most important and interesting of the *Abietinæ.* Its geographical distribution is very extensive, being found in Europe from the Mediterranean on the south to latitudes as high as 70° on the north, and from Spain and Britain on the west, to Siberia in the east. It also occupies regions in the north, the east, and west of Asia, but has not been found in America, unless the species growing at Nootka Sound should prove a stunted variety. In Britain it is the only indigenous species of the fir tribe, and at some distant period, from the remains of large trees, cones, &c., found in peat mosses, appears to have occupied most of the elevated tracts of the kingdom, though the natural forests now remaining are greatly reduced and confined to the mountainous districts of Scotland. In Ireland, also, where extensive forests once prevailed, they no longer exist. In Scotland it grows at a height varying from one thousand four hundred to as much as two thousand seven hundred feet, but at this latter altitude it dwindles almost to a bush ; in the more southern parts of Europe the zone it occupies extends to a greater elevation, being in some countries upwards of four thousand feet, while in the colder regions of Norway, Lapland, &c., under 70°, it only reaches to seven hundred feet above the level of the sea. Widely dispersed, however, as the species is found throughout all the mountainous regions of Europe within the limits of its appropriate zone, it is between latitudes 52° and 65° that it is met with in the greatest profusion and becomes the prevailing tree. Thus upon the extensive plains of Poland and Russia it occurs in forests of immense extent, as well as in Northern Germany, Sweden, Norway, and Lapland, up to the 70° of north latitude, in all which countries a large proportion of the surface is almost entirely occupied by its dense masses, and from which almost inexhaustible resources Britain, as well as other countries draw their principal supply of the finest Red Pine timber. The indigenous forests of Scotland, which formerly occupied so large an extent of its territory, have, within the last sixty years, been greatly reduced, in consequence of the demand for Pine timber, occasioned by the difficulty of obtaining wood from the Baltic during the late wars; some, indeed, are nearly obliterated, as that of Rannoch, which once occupied an extensive area, but whose site in many parts is only now to be traced by the decaying roots which rise above the ground, or by the occasional appearance of small detached groups or single trees, which escaped the destroying axe, either from their trifling value or the peculiar and perhaps inaccessible situations in which they grew. Such, also, has been the fate of the forest of Glenmore, once famous for the size and age of its timber, whose magnificent pines clothed one of those romantic glens or passes intervening between the mountain mass of Cairngorum and the river Spey, and which once formed a continuation of that of Rothiemurchus. This noble forest was purchased of the Duke of Gordon in the year 1783, by William Osborne, Esq., a merchant of Hull, for the sum, according to Sir T. D. Lauder, of 10,000*l*. Out of its produce no less than forty-one sail of ships were built at the mouth of the Spey, of upwards of nineteen thousand tons burthen, and amongst them a frigate called the Glenmore, of one thousand and fifty tons. The cost alone in labour of converting the produce of this forest, is stated by the purchaser to have amounted to seventy thousand pounds. Of the size attained by some of these trees an idea may be formed from the inspection of a plank deposited in the entrance hall of Gordon Castle, presented to the late Duke of Gordon by the purchaser of the forest as a specimen of the growth of one of its trees; it is six feet two inches long, and five feet five inches broad, with the texture of the finest Red-wood Pine, and showing annual growths to the number of two hundred and thirty-five. Some eighteen years ago, when we passed through Glenmore on a walking excursion from the banks of the Dee to those of the Spey, the tract previously occupied by this once magnificent forest exhibited a scene of savage wildness and desolation. Scattered trees, some of which were in a scathed or dying state, of huge dimensions, picturesque in appearance from their knotty trunks, tortuous branches, and wide-spreading heads were seen in different directions, at unequal and frequently at considerable distances from each other; the solitary and mournful-looking relicts of the departed glories of this once well-clad woodland scene, and which had only escaped the axe from their previous decay, or the comparative worthlessness of their knotty trunks, while the surface of the ground in almost every direction was littered and bristling with the decaying tops and loppings of the felled trees, among which mosses of various species were growing with a luxuriance we scarcely ever saw equalled, nourished, it would appear, and encouraged by the partial stoppage and stagnation of the surface water thus impeded in its course,—this rapid accumulation of these cryptogamic plants threatened, at the time we mention, to convert a large proportion of the surface that had once been forest, into a peat moss; but we gather from Sir T. D. Lauder, who has subsequently visited it, that the forest of Glenmore is fast replenishing itself, the seedling firs starting in countless thousands from its surface, and promising, from their rapid growth, again to restore to this wild mountain glen the gloomy character of its pristine forest scenery. A little to the west of Glenmore, and nearer to the Spey, upon an irregular surface, varied and interspersed with numerous highland lochs, stands the forest of Rothiemurchus, which, at one period, covered with its dense masses a surface of sixteen square miles. The axe, however, for many years past, has been busily at work, the profits to the proprietor, from the fall of pine timber, according to Sir T. D. Lauder, having sometimes amounted to 20,000*l.* in one year.

In consequence of the rapid and wholesale destruction of this once extensive forest, it is now nearly denuded of its old and finest timber, and scarcely exhibits a remnant of its ancient growth. Its renovation, however, is rapidly going on, as a thriving crop of seedlings spring naturally up after every fall of timber, which, if protected from the inroads of cattle and sheep, thrive vigorously, and in time will no doubt emulate the dimensions of their progenitors.

The timber of this forest, from the close thick manner in which the trees originally grew, was clean, straight, and of excellent quality, though not of equal diameter to the pines of Glenmore: Mr. Grigor, in his report,* states that he found the trees averaging, at six feet from the ground, about four feet six inches in girth, the bole diminishing but little for upwards of thirty-five feet in length. The average height of the trees was about seventy feet, and their age from one hundred and twenty to one hundred and twenty-five years.

The soil of this forest, except the hollows, which are peaty and moist, he describes as dry and sandy; the substratum being a hard granitic gravelly loam. Lower down upon the south side of the Spey, near the southern extremity of Morayshire, is the ancient forest of Abernethy, the property of the Earl of Seafield. It stands upon a tract diversified by hill and dale, the soil of which consists for the most part of a thin sandy peat, with a subsoil of hard, yellowish-brown, granitic, gravelly earth.

The timber of this forest is esteemed for its superior quality, being very resinous, and consisting almost wholly of matured red wood. The Duthal Pine forests, the property of the same nobleman, to the west of Abernethy and on the north bank of the Spey, occupy a mountainous surface; the finest timber, as might be expected, growing upon the sloping bases of the hills and lowest grounds. In this forest, the prevailing soil of which is a thin sandy peat, upon a rich subsoil of brown granitic mould, the timber is also of excellent quality. Many of the trees examined by Mr. Grigor, girted from six to twelve feet at one foot from the ground, and exhibited from one hundred and twelve to one hundred and twenty-five annual rings; the sap wood upon each tree did not average more than one inch and a half in thickness.

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* See his report in "Trans. of Highland Soc."

Upon the Dee, the forests of Braemar and Invercauld are of very large extent, and produce Pines of as great a size as any that are to be met with in Scotland. During our excursions to that interesting portion of the highlands we have frequently admired the beautiful forms and huge proportions of some of those near to Mar Lodge and the falls of the Dee, particularly where the trees had stood sufficiently apart to allow the retention of a portion of their side branches, and the full and unrestrained expansion of their heads, objects indeed well worthy of the pencil of the artist or the commendation of a Gilpin or a Lauder. But, alas ! since we last visited that interesting district, we have learnt with regret that the axe has been let loose within the precincts of the forest of Mar, and that already much of its finest timber has fallen beneath its fatal stroke.

Such are the principal remnants of those ancient Caledonian forests, which, to judge from the constant occurrence of Pine trees, found buried beneath the peat mosses wherever they have been dug into, as well as from other remains, and old decayed roots upon many extensive wastes, would seem, at some earlier period, to have spread over a much larger portion of its surface than they now occupy. To their present limits they have been reduced, not more effectually, we believe, by the axe, than by the great increase of herds and flocks, which, once admitted in any considerable numbers within the precincts of forest land, soon put an effectual stop to the renovation of its timber, by constantly browsing upon and destroying the seedling plants as they spring from the ground.

In all these native forests we find the soil is generally of a dry sandy or gravelly nature, composed of the *débris* of the older or granitic rocks; this, indeed, appears to be the soil most congenial to the nature of the common

Pine, not only in Scotland, but in the other countries where it is the prevailing species; at the same time, we may remark that it will grow, and sometimes luxuriantly, upon ground of a different description, and whose component parts are derived from rocks belonging to a more recent series, provided the subsoil be dry beneath. In these granitic soils the substratum is frequently of considerable thickness, and of a yellowish or brown colour, being a mixture of abraded rock and earthy matter, and it is always where this soil proves of the richest quality that the finest and largest Pines are found to grow; thus, Mr. Grigor observes, " the soil of the highland forests is found of different qualities, which in some manner regulates the quality of the timber. The richest ground produces the largest trees, consequently, the timber is not so fine in the grain as that grown on sand or poor gravel; but the quick-grown trees appear as full of resin, as healthy, stand to as great an age, and are as red when cut up as those which grow on poorer soil. In general," he adds, " the soil of the native highland forests is superior to that in which firs are commonly planted throughout the low country."

In addition to the native forests, artificial Pine plantations of great extent exist in Scotland; these began to be formed about the commencement of the eighteenth century, and were composed exclusively of this tree till the introduction of the larch as a forest-tree, about the middle of the last century, in a great measure suspended its use, as it was found that besides producing a more valuable timber at every stage of growth, the latter tree grew faster, was equally hardy in its constitution, and did not require a soil of a different or better quality than what was necessary to bring the Pine to perfection. In consequence of this superiority over the fir, the larch has been largely introduced in all those extensive plantations that have been made within the last fifty or sixty years in Scotland, and particularly in the highland districts; some proprietors mixing the species in equal numbers, others in the proportion of two larches to one Pine. In England, also, at one period, the Pine was mostly planted in masses by itself, and as the nature and quality of the proper Pine soil does not appear to have been understood or taken into consideration, these plantations were usually limited to the poorest and most impoverished soils of every description, under the supposition, we presume, that because this tree flourishes amidst the wild heathy districts of the Scottish highlands, it must therefore succeed upon barren tracts of every description. As might be expected, the progress of many of these plantations, made upon soils unfitted to bring the tree to perfection, or any tolerable scantling, was seldom such as to answer the expectations of the planter, and this, together with the improper uses to which the unmatured timber at an early age, and when consisting entirely of sap wood, was applied, brought the Scotch fir into great disrepute in England; such, indeed, was the prejudice created against it towards the close of the last century, that by some proprietors an indiscriminate destruction of the Pine was commenced, and some writers advised its utter exclusion from every soil and situation in which any other tree could be made to grow. This prejudice, we believe, still exists to a very considerable extent, and though the Scotch fir continues to be admitted into most mixed plantations in a certain proportion, it is much more frequently as a nurse and protector to the oak and other species, than for the timber it produces.

The Common Pine is naturally slow in undergoing that change which converts the white or sap wood, into red or matured timber, a change, we believe, that rarely commences, at least in lower and richer grounds, before it has attained thirty or forty years' growth.

The red wood timber of the Scottish forests, similar, in every respect, to the best Baltic Pine, is the produce of trees that have numbered from one to two or more centuries; thus, the trees in the forest of Rothiemurchus were found by Mr. Grigor to average from one hundred and twenty to one hundred and twenty-five years, some in that of Abernethy from two hundred to two hundred and forty-two years. In Norway it is not considered full grown timber till it has reached from one hundred and thirty to two hundred years; and in Silesia, we are informed by a resident proprietor, that the forests are each divided into one hundred equal divisions, one of which is cut over every year, by which arrangement an annual fall of timber is secured of one hundred years' growth, under which age it is not considered as having reached maturity or to be fit for the market. It seems, then, rather preposterous, that any one should expect that plantation fir-timber, cut down when, perhaps, not more than thirty years old, and consisting entirely of sap wood, should, without any preparation, be adapted to all those purposes which require the best full-grown and matured timber, and yet such seems very generally to have been the case, and to the disappointment at not finding those expectations realized may be attributed a large portion of that prejudice and dislike so generally entertained towards this tree. Inferior, however, as the sap wood may be in many respects, when compared with Pine timber in its red or matured state, we deny that it is of so worthless a nature as many have described it; if properly prepared and treated, that is, sawn up immediately upon being cut and carefully dried, it is not only durable, but is tougher and less liable to split than the matured timber. In this opinion we are supported by the authority of Mr. Matthew, who says, "Boards of sap wood, or fast-grown Scots fir, particularly of the outside layers, are much better suited, stronger, and more lasting for boxes used as carriage packages, or for machinery, or cart lining much exposed to blows and friction, than boards of the best matured red wood of Memel, Swedish, or Norway Pine. To have these sap-wood boards in perfection," he adds, "the tree must not be left in the bark after felling, and the boards must be well dried soon after being cut."

It has also been used for roofing, and other building purposes with success, and found durable after having undergone the process of steeping in lime water; this mode of protecting the fibre of Scotch fir sap-wood, was first practised by Sir J. Menteath, Bart., of Closeburn, Dumfriesshire, some fifty years ago, and he finds, that sap-wood which unprotected would not have lasted thirty years, after having been subjected to this treatment, shows not the slightest symptoms of decay, after having been put up for more than forty years. The solution is made by dissolving a small quantity of quick lime in the water in which the wood is steeped, and in which it ought to remain for ten days or a fortnight. Kyanizing, or the solution of corrosive sublimate, would, doubtless, be equally if not more effective than the lime, but more costly in its application.

By many it has been affirmed that plantation Pine wood never acquires the properties and excellence of forest-grown timber. To this opinion, however, we are not inclined to yield an unqualified assent, for, we believe, provided that fir plantations be made upon soil really congenial and adapted to the habit and nature of the tree, and where plants of a good variety and from seed of the true native Pine are selected, that, under such circumstances, the timber, if allowed to attain maturity, that is one hundred years' growth or upwards, would be little, if at all, inferior to that grown in the highland or foreign native forests. Upon soils unsuited to its habit, but such as are very frequently selected for the sites of plantations, we admit that it never can arrive at such perfection, inasmuch as the conditions are then wanting to effect the maturation or proper conversion of the fibre into heart-wood.

In Scotland many examples of plantation fir, when allowed to obtain a proper age, have been found to produce timber in every respect similar and equal to the native tree, and even, in some parts of England, the common Pine, when aged and matured, has been pronounced, by a planter and manager of timber of high and deserved repute,* to be equal, in point of strength and durability, to any foreign deal whatever.

The wood of the Pine, in its matured state, varies in colour from a yellowish to a brownish red, and it is observed that logs of the deepest tint are harder, firmer, and more durable than those of a paler colour, the former possessing more of the inspissated resinous deposit than the latter. Slowness of growth is considered to be one of the requisites necessary to produce the best Pine timber, but, though this may be affirmed as generally correct, where hardness, density, and strength are looked to, it has its exceptions, and logs of slow or small growth are not unfrequently met with inferior in strength and more tender than those whose growth has been quicker, as indicated by the width of the annual layers or circular deposits of wood. Much, also, depends on soil and climate, and not a little, we believe, upon the habit or constitution of the individual or the variety to which it belongs, for there are some forms of the common Pine, that, even under the most favourable circumstances, produce a white soft wood, destitute of the resinous deposit, and without either strength or durability. On the contrary, where the variety is naturally good, timber of excellent quality is often produced, where the other circumstances considered necessary to its perfection seem to be wanting; thus, Lawson in his Manual mentions a plantation of Scots fir that grew near the side of the Perth and Dundee road, and which was originally stocked with plants raised from seed obtained from the forest of Mar, already mentioned as remarkable for the size and beauty of its trees. After standing about eighty years the plantation was cut down, and the timber, he remarks, "although grown on a poor, damp, and tenacious clay, besides attaining a great size, was found equal in quality to that for which the above-mentioned natural forest is esteemed." Mr. Matthew, also, when speaking of the timber of the Scotch fir, says, "by far the best timber in quality, of its age, of any we know, stands upon a very adhesive coarse clay." These exceptions, however, we do not bring forward as indicative of any preference shown by the Pine to such soil, but to prove that when the variety or kind is naturally good, it will, at least for one generation, mature its timber, even when grown upon soil very different in quality to that it naturally affects or upon which it is found native.

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* Mr. Thomas Davis. See a paper by this gentleman in the "Transactions of the Society of Arts," vol. xvi.

The durability of Pine timber, when fully matured, indicated by the redness of its colour, is considered to be scarcely inferior to that of the oak, and instances are given where timbers of Pine in the roofs of old buildings had, after the lapse of several centuries, been found perfectly sound; amongst these is one mentioned by Dr. Smith in the "Transactions of the Highland Society," where the timbers of an old castle, after they had sustained the roof for three hundred years, when taken down were found as fresh and full of resin as newly imported timber from Memel. In addition to durability the wood of the Pine is light, stiff, and strong, easily worked, and freer from knots than most other species of fir, qualities which render it admirably adapted for all kinds of house carpentry and joinery; its length and straightness of trunk, as well as the large scantling it attains, fits it also for the main timbers of buildings, such as rafters, joists, &c., which are almost universally made of it. In naval architecture, again, it is very extensively used, and the best masts and spars are considered to be those of the common Pine, imported from Riga and other parts of the Baltic. Entire ships are also frequently built of it, but these are better calculated for trade than for vessels of war, as they are not only weaker and less durable than those built of oak, but they have the disadvantage of splintering to a much greater extent when struck by cannon shot, which is always attended with greater danger and destruction of life, than when the missile merely opens itself a passage through the wood. In a young state, as we have already remarked, the wood of the Scotch fir is very inferior to the same when matured, and, in order to render it useful and available, it must be subjected to some artificial process. It is, however, far from being an unprofitable wood to the planter in many districts, even in this inferior state, as the thinnings, by the time they are twenty years old, are of size sufficient to cut into staves for making the barrels in which the smoked or red herrings and other dried fish are packed. Throughout the whole of the coasts of Scotland and the North of England, they also afford the chief supply of pit props, consumed in enormous quantities by the collieries of the Tyne and the Wear, and are now beginning to be employed in forming the wooden pavement lately introduced into the streets of the metropolis. For most of the above uses, a crop of Scotch fir may be obtained from soils too poor to bring even the larch to a marketable size.

In Britain the resinous products of the Pine are seldom turned to any account, but upon the Continent, in Sweden, Norway, Russia, &c., the greater proportion of the tar of commerce is procured by a kind of dry distillation of the Pine, the wood being subjected to a slow combustion as in making charcoal, when the tar, which exudes from it in the form of a thick, blackish brown liquid, is conducted into vessels or barrels so placed as to receive it. The tar, when it is wished to convert it into pitch, is boiled slowly and for some time in large copper vessels, after which it is let out, and as it cools hardens into that substance. Turpentine, also, but of an inferior quality to that procured from the silver fir, is obtained by stripping off a piece of bark from the trunk of the tree in spring, when the sap is in motion, and the resinous juice that exudes is received in a notch or hollow cut in the tree, at the bottom of the canal formed by removing the strip of bark; this juice, as it accumulates, is ladled out into a basket, and the liquid that passes through the interstices is the common turpentine. The residue, or thicker matter that remains behind, is then put into a common alembic with a large quantity of water, and, on distillation, the essential oil or spirits of turpentine comes over, leaving a residuum of the common yellow resin of the shops at the bottom of the still. There are, also, a variety of other uses to which the Pine, or parts belonging to it, are applied; thus, in Russia and Lapland, the outer bark, like that of the birch, is frequently used by the natives for covering their huts, or, as a substitute for cork, to float the nets of the fishermen. Strong and elastic ropes are also made of the inner bark, which is also sometimes woven into mats like those made from the lime tree. In Norway, we learn from Mr. Laing* that, in years of scarcity, which not unfrequently occur in that country, in consequence of early autumnal frosts, which prevent the ripening of the cerealia, the inner bark of the common Pine is actually used by the inhabitants, and that to a considerable extent, as an ingredient in their bread. For this purpose it is very highly kiln-dried, and then ground with a portion of high dried oats into a very fine meal, and the bread baked of this mixture is said to be by no means unpalatable or unwholesome. The mode of preparing it is "in flat cakes, covering the bottom of the girdle or frying pan, and as thin as a sheet of paper, being put into the girdle in nearly a fluid state."

In Russia, many of the roads are formed of the trunks of the Scotch Pine, trees from six inches to a foot in diameter at the larger end being selected for the purpose; these are laid down side by side across the intended road, the thick end of the one alternately with the narrow end of the other, and the branches being left at the end to form a sort of hedge on each side of the road; when thus laid, the hollows between the trunks are filled up with earth, and the road is finished; this kind of highway is precisely analogous to what are termed Corduroy roads in North America, and we believe are usually as uncomfortable and jolting to the traveller.

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* See Laing's "Journal of a Residence in Norway."

As fuel, the wood of the Pine, though it gives out much heat and is easily fired, burns very rapidly, accompanied by a black disagreeable smoke, on which account it is inferior to many other woods as a chamber fuel. The charcoal it produces is excellent, and is made in large quantities where tar is manufactured. Of the roots torches are made, and, when split into thin pieces, are frequently used in the highlands as a substitute for candles, and of this material they commonly make the lights used by the fishermen in our northern rivers, when engaged in the exciting nocturnal amusement of Leistering, that is, spearing the salmon.

Before we proceed to speak of the mode of propagation and the management of the Pine, a few observations upon its ornamental properties and the effect it is calculated to produce in landscape scenery may not be deemed out of place. If our observations were to be confined or limited to the appearance of the Pine as seen in close plantations consisting entirely of the species, or even to the internal or thick part of the natural forest, where the trees are drawn up to straight naked poles, devoid of side branches, surmounted by a mere tuft of sombre green, and exhibiting a gloomy sameness of character, or to those miserable-looking belts of fir so frequently seen in England and the lowlands of Scotlands as boundaries to property, or lining the sides of our public roads, admitting through their starved and naked stems the whistling wind and driving shower, we might possibly concur in opinion with those who, without restriction, lavish unbounded abuse upon the

Pine; but, as we consider that the tree, under these circumstances, is seen under a false and unnatural character, we turn to view it in those instances where it has been judiciously planted upon a soil capable of bringing it to full size and maturity, and where ample space has been given to allow it "to form its head amongst the thick branches," or else to those noble specimens and picturesque groups, which we have so often admired when growing in its native highland wilds, and which have been introduced with such effect into the beautiful productions of some of our most gifted artists; under these more favourable circumstances, and in what we deem its natural state, we pronounce it, without hesitation, to be one of the most picturesque, and also amongst the most magnificent of our forest trees. In this opinion we are supported not only by the authority of Gilpin, who speaks of the Pine, when thus permitted to assume its natural form and spread its ample head aloft, uncontrolled by the close approach or interference of other trees, in terms of high approval, but also by the commentary of his accomplished editor, Sir T. D. Lauder, who, with the feelings of one who truly appreciates the romantic scenery of his native land, exclaims, "We, for our parts, confess, that when we have seen it towering in full majesty in the midst of some appropriate highland scene, and sending its limbs abroad with all the unconstrained freedom of a hardy mountaineer, as if it claimed dominion over the savage regions round it, we have looked upon it as a very sublime object. People who have not seen it in its native climate and soil, and who judge of it from the wretched abortions which are swaddled and suffocated in English plantations, amongst deep, heavy, and eternally wet clays, may well call it a wretched tree; but, when it stands freely on its native knoll of dry gravel, or thinly covered rock, over which its roots wander afar in the wildest reticulation, whilst its tall, furrowed, and often gracefully sweeping red and grey trunk, of enormous circumference, rears aloft its high umbrageous canopy, then would the greatest sceptic on this point be compelled to prostrate his mind before it, with a veneration which perhaps was never before excited in him by any other tree."

In planting the Pine for its ornamental and picturesque effect, whether singly or in groups, soil, as well as situation, must be particularly attended to; the one to ensure its reaching its full dimensions, the other, that when grown up it may produce the greatest effect, either by contrast with other surrounding trees, or by the beauty of its own form and the appropriate station in which it is placed. In respect of soil great richness is not required, but it is essential that the substratum be dry, and as to the sites selected, these must be regulated by rules of taste and the peculiar features and locality of the place. One essential point must be observed, viz., that the plants be of the best variety, and immediately derived from seed of the native highland Pine.

As this tree is propagated entirely by seeds, the greatest care ought to be taken by the nurserymen, in justice to the planter who purchases his trees, to see that the seed from which he raises his stock be gathered from a good variety, and if possible from trees of the native highland forests. In case a sufficient supply of seed of this description cannot be procured, then, as the next in goodness, such as is produced by plantations that have been made upon a granitic or proper Pine soil, and the trees composing which are themselves the offspring of forest seed. Inattention to so important a consideration as the selection of proper seed, has, we believe, mainly contributed to the introduction of that spurious kind or bad variety of Pine which has been so generally complained of, and which has tended to bring additional odium and disrepute upon the tree; for a large proportion of the plants that have been raised in the lowlands of Scotland and in England, are from seed gathered from an inferior variety, deteriorated still more by being planted in an ungenial soil and climate, as it is well known that such trees are in the habit of producing a more abundant crop of cones than the free-growing healthy variety of the forest. The necessity of procuring seed or plants immediately from the native tree is, we think, evidently shown, from what is now taking place in regard to the Common Pine in some parts of England, and more particularly in Norfolk. When first introduced into that country, it is supposed that the trees, or at least the seed from which they were raised, was procured from Scotland; these trees, in consequence, we believe, of their immediate descent from the wild original, in many instances have attained large dimensions and become fine timber; but such seems to be the effect of soil and climate different to the one in which the Pine grows naturally, that the plants raised from the seed of these Norfolk trees are so deteriorated in constitution, that few of them when planted live for more than twenty-five years.

The cones of the Pine should be gathered in December or January, as the scales soon after the latter month begin to open and shed the seed in consequence of the increasing heat and influence of the sun. When gathered and laid by in a dry cool place they will, if required, keep good for a couple of years, but if the seed be wanted forthwith they ought to be exposed to the rays of the sun till the scales expand and the seed falls out. This by many is effected in a much quicker way by subjecting the cones to the process of kiln-drying, a mode, however, which unless conducted with the greatest care, we consider, in common with Boutcher and Matthew, as likely to prove highly injurious to the constitution of the future plants.

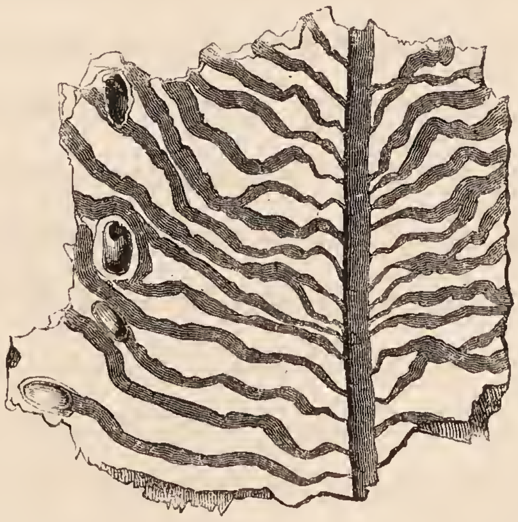
The time for sowing is from the end of March to the beginning of May, according to the nature of the season. A light free soil is selected for the seed-beds, and the seed, which is sown very thick or so that the plants rise within a quarter or half an inch of each other, is covered with a sifting of fine soil to the depth of about a quarter of an inch. The young plants are generally allowed to stand two seasons in the seed-bed, and are then transplanted into nursery lines, from whence, in another year they are in good condition for planting permanently out. Such is the general practice of the nurseries, but there are proprietors who raise their own trees, and plant directly from the seed-bed; in this case the planting iron is the instrument usually employed for the purpose, and with it a skilful workman will insert from three to nearly four thousand plants in a day. But where transplanted trees of one or more years old are used, the slitting or T method with the common spade is preferable as it affords a better bed and firmer receptacle for the enlarged roots, although a workman may not be able to insert nearly so many trees within the same time. In general from four to five thousand plants are allowed to the imperial acre in making plantations consisting exclusively of Scottish Pine; but such are now becoming comparatively rare even in the highland districts, as the larch is now largely introduced, being found to grow and thrive in soils of the same description, and at nearly as high an elevation as the Pine. In the lowlands and in England plantations of Scotch fir are now seldom made except upon the poorest soils and most exposed situations, as it has been discovered that many other trees will readily grow upon ground that formerly was thought incapable of producing any other tree than the Pine; in consequence, that tree is now almost exclusively used as a nurse plant, to foster and protect the deciduous species, though even for this purpose we prefer the larch, and, where the soil will admit of them, the spruce and silver firs.

In the natural forests, after a fall of timber, all that is necessary to secure the reproduction of the Pine, is to keep the ground free for a certain time from the depredation and inroads of cattle and sheep, so that the seedlings may spring up unmolested and uninjured. In these forests, Mr. M'Pherson of Ballendalloch, a correspondent of Mr. Loudon's, remarks, " The plants spring up in thousands and of different ages, and being, consequently, of various sizes, the stronger gradually destroy the weaker, until the wood is reduced to the distances at which the trees can ultimately stand, whilst the lateral branches gradually decay and fall off, so that thinning and pruning are quite unnecessary." Mr. Grigor, also, in his report previously quoted, seems to consider these operations as scarcely necessary in respect to native forests, though it is occasionally done by some proprietors where the trees are very much crowded and of nearly equal size, especially when situated near a road or river, where the timber is of most value, " but this," he adds, " is not attended to in the more remote parts of the forest."

Artificial plantations, however, seem to require somewhat of a different treatment, for the trees being all planted at the same time, and of the same age, rise together of equal size and strength; it therefore becomes necessary to thin out a certain proportion, in order to secure a crop of large timber, and this ought gradually to be effected, as they get too close, and are drawn up too tall and slender for their girth. Thinning, however, ought not to be commenced too soon, for as the value of Pine timber depends upon its length and cleanness of stem, and as this is produced by the decay and falling off of the lateral branches, the first thinning should not take place until several tiers of the lowermost branches are actually dead, this may then be repeated as often as the trees seem to require additional room and air, until they stand at distances sufficient to ensure them reaching their full dimensions. In regard to the question of pruning, or divesting the Common Pine and other *Abietinæ* of their branches, there are different opinions, some recommending the excision of a certain proportion of the living as well as the decayed branches, while others strongly object to the removal of any branches while alive, and would even leave such as had died a natural death to fall of themselves. Of the two opinions here stated we decidedly coincide with the latter, for we consider that the lopping of living branches from any of the *Abietinæ*, is always injurious to the health of the individual, and in regard to branches that have undergone a natural decay we have frequently observed, and particularly in the *Pinus sylvèstris*, that the timber of such trees as had naturally freed themselves of their side branches, when cut up, did not exhibit larger knots, or these in a more decayed state, than in trees where the dead branches had been pruned or cut off. Indeed, it will be perceived by attention to the natural process, that where the decayed branches are, as it were, thrown off, there the decay ceases, the interior part or knot being of hard consistence and full of resin.

Besides the heart-rot to which Matthew says the Scotch fir is liable in wet ungenial soil, there is another disease to which it is subject, and which proves frequently fatal in our own and other plantations in the north of England, but which hitherto has not been observed to affect the trees in their native forests or in the highland districts. This is caused by the attack of a cryptogamic plant, the *Æcidium pini*, beautifully figured in Dr. Greville's "Cryptogamic Flora," pl. 7. vol. i. In general, the leaves only are affected, and then seldom to such an extent as seriously to injure the tree; but, in the instances to which we allude, it attacks the bark, sometimes of the larger branches, but more frequently of the main stem itself, and this, in many instances, when the tree is thirty or forty years old. When the Æcidium attacks a tree, the place is easily recognized by the swollen appearance of the bark, and it becomes still more conspicuous when the cysts begin to discharge the orange-coloured powder, or *sporidia*, with which they are filled. The bark, by the growth of this parasite, becomes completely disruptured, and its texture destroyed at the place of attack, and in consequence a great flow of resin ensues, and the tree usually dies in the course of a few months. Previous to the appearance of the *Æcidium*, we have not observed that the trees attacked showed any symptoms of decay or ill-health, though we are strongly inclined to believe that there must be some predisposition in such individuals to receive the *sporidia* of the parasite. The only accident of any consequence to which the Pine is liable results from heavy falls of snow, which, when unattended by wind, sometimes accumulates in such masses as to snap in sunder or tear from their sockets the long and often nearly horizontal branches of this tree.

The insects which feed upon the *Pinus sylvestris* are numerous, and belong to various orders of the class: some live upon the foliage, others upon the wood, either in a fresh or decaying state; others again are subcortical feeders and live upon the inner portion of the bark, and some few confine their depredations to the decaying roots. Most of the leaf-eaters consist of the caterpillars of the *Lepidoptera*, and those of the *Tenthredinous* section of the *Hymenoptera*. Of the *Sphingidæ*, there is the caterpillar of the *Sphinx pinastri*, a large and beautiful species but of rare occurrence in Britain. *Eutrichia pini*, belonging to the Linnean *Bombyces*, whose caterpillar is covered with hair which causes great irritation when handled, is also occasionally met with. Of the *Lithosiidæ* three or four species feed occasionally upon this fir. Amongst the *Noctuidæ*, is *Achatia piniperda*, fortunately of rare occurrence in this country, but sometimes very destructive to the continental Pine forests. Of the *Geometridæ* the *Bupalus piniarius* is far from uncommon in the north of England, and appears to be upon the increase. Of the smaller moths belonging to the *Tortricidæ* and *Tineidæ* there are several species, among them *Œcophora oliviella*, whose caterpillar subsists upon the half-decayed liber of dying trees. Amongst the *Tenthredinæ* the pseudo caterpillar of *Lophyrus pini* sometimes commits great ravages, but its visits are uncertain and at considerable intervals. Though most of the wood-borers or internal feeders belong to the *Coleoptera*, we may here particularize the larva of the genus *Sirex*, Linn: (*Urocerus* Geoff.) belonging to the *Hymenopterous* order. In a perfect, or winged state, some of the species resemble hornets as to size and colour; the females are provided with a strong horny ovipositor, by means of which they deposit their eggs beneath the bark of the tree, and the larvæ, as soon as hatched, commence boring into the wood in various directions. Of the *Coleopterous* wood-borers, the *Hylobius abietis*, one of the largest of the British *Curculionidæ*, is plentiful in the north of England and Scotland, but we have not ascertained that it does serious injury to the trees, its larva subsisting upon the decaying roots; *Pissodes pini*, another of the weevil tribe, and very destructive to the Pine upon the Continent, is rare in this country. Of the *Bostricidæ*, which come under the designation of subcortical feeders, the species of the genus *Hylurgus* have always been supposed to be particularly injurious to the Pine, and amongst them none more so than the *Hylurgus piniperda*, represented in the annexed cut. The attack of this insect upon the Pine, like that of the *Scolytus destructor* upon the elm, seems very generally believed to be the immediate cause of the decay and death of the tree; this, however, we are convinced is not the case, for after many years of attentive observation, we have never in one single instance found the *Hylurgus* attacking a tree in perfect health; in all cases, and these are by



no means unfrequent in our plantations, the tree, previous to the attack, is always observed to be in an unhealthy state, indicated by diminutive shoots, hide-bound appearance and yellow tinge of the foliage, and would eventually die, even if defended from the access of the *Hylurgus*. In short, the liber, or inner bark of the tree, must be in a certain state of incipient decay, before it becomes a proper food for the larva of the *Hylurgus*. As soon as a tree falls into this state, it is immediately resorted to by the perfect insects, which bore through the outer bark, and then proceeding in an upright direction, deposit their eggs on each side of the canal they eat out, and from whence each young grub diverges at an angle, and continues to eat its way till full-grown, when it changes into a nymph, and when perfect makes its way through the outer bark. In its imago state this insect also attacks the young shoots of the Pine, entering horizontally at the lower part, and excavating its way upwards through the heart of the shoot, and thus destroying it; but as the side and smaller shoots are generally selected, we have seldom seen any serious injury done to the trees thus attacked. To the same family belongs the genus *Tomicus*, whose species are also considered to be destructive to the Pine, though we think further observations will probably show that they, like the *Hylurgus*, are not the proximate cause of decay, but subsequent to it. Amongst the *Cerambycidæ*, or *longicorn* beetles, the *Callidium striatum* is occasionally taken in Scotland, and *Rhagium bifasciatum* we find abundant in old decayed roots and posts of Pine.

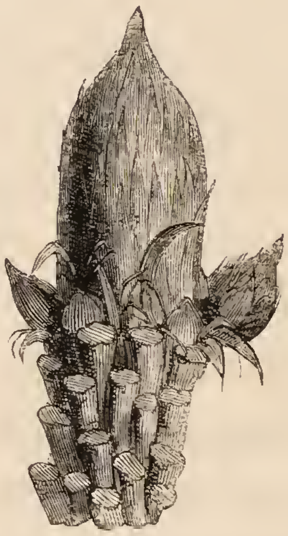
Of the *Pinus sylvestris* there are several marked varieties in Britain, differing not only in form and habit, but in the size and quality of their timber. In some the wood is white, soft, without resin, and perishable; in others it is firm, resinous, red-coloured, and durable; it therefore becomes a matter of the first importance to the planter that the nurserymen from whom he procures his trees should be very particular in the selection of this seed, and that the people he employs to collect the cones should have directions as to the trees from which they ought to be gathered. This, indeed, becomes the more necessary, as the inferior variety produces cones much more freely than the other, and when no restriction is enforced or particular directions given it is natural to suppose that the seed-gatherer, when paid for quantity and not for quality, will collect the cones from trees on which they are most abundant and can be most easily procured. It is from this inattention to the collecting of Pine seed, that the introduction of the inferior variety in so large a proportion as compared with the better kind in so many Pine plantations may be attributed, and not, as Sir Walter Scott mistakingly supposed, to the introduction of an inferior variety from Canada, in which country, and other parts of North America, the *Pinus sylvestris* is not an indigenous tree, and from whence no seed could be obtained. The three principal varieties of the *Pinus sylvestris* in this kingdom were first accurately described by Mr. Don of Forfar, in a memoir published in the first volume of the Caledonian Horticultural Society. The first, to which he gives the title of *Pinus sylv. vulgaris*, Common Wild Pine, is distinguished by its close pyramidal head, the branches growing upwards at an acute angle with the trunk, the leaves marginated and of a dark green, without any glaucous appearance beneath, and the bark of the trunk very rugged. This variety, he remarks, seems to be but short-lived, becoming soon stunted in its appearance, and is altogether a very inferior tree to either of the other two varieties. It is also the same which unfortunately predominates in so many artificial plantations, and whose inferior qualities have tended to bring additional discredit upon the Pine; it also seems to be the variety to which Sir Walter Scott especially refers when he speaks of an inferior kind of *Pinus sylvestris* introduced from North America. Its cones, which are elongated and pointed, are produced in great abundance, a circumstance that unluckily tends to its extensive dissemination.

To the second variety is given the appropriate name of *Pinus sylvestris horizontalis*, from the horizontal direction of its branches, which spring at nearly a right angle to the trunk. The leaves are broader than those of the first variety, serrulated and not marginated, and of a fine glaucous colour on the under surface. The bark of the trunk is not nearly so rugged, and is of a rich yellowish brown colour. Its cones, also, are rounder, smoother, not so much pointed, and seldom produced in large quantity, like those of the first variety. It is a rapid, free-growing tree, of a hardy constitution, and attains a large size, not only in granitic but in other soils and situations, and loses its pyramidal form when old. This appears to be the variety producing the finest trees and best timber in the highland forests, and, we think, must be the same as the *Splatch Pine* mentioned by Mr. Matthew, and so called from the appearance of the rougher part of the bark, which is disposed in flat oblong lumps, and not in deep, longitudinal furrows as in the first variety. Of late years, the nurserymen in the north of Scotland have been particular in collecting the seed of the best variety of the Pine, the example having first been set by the Messrs. Grigor, nurserymen at Elgin, and the good effect, we may remark, is already visible in the appearance of the Scotch Pine plants, in plantations made within the last fifteen years. Mr. Don's third variety is easily distinguished from the other two, for although it has the pyramidal growth of the first, its leaves are still more glaucous, or of a more silvery green than those of the second ; its cones also are remarkable, in having the bosses of the scales elongated and bent backwards, in the form of blunt prickles, from which circumstance it received the name of *Pinus sylvestris uncinata.* It is not, however, to be confounded with the *Pinus uncinata* of Captain Widdrington, a species certainly nearly allied to *Pinus sylvestris*, but which inhabits a still higher zone, and whose distribution seems confined to the mountain ranges of the peninsula. This variety in the Scottish forests is of more frequent occurrence than the *Pinus sylvestris horizontalis*, and produces an excellent timber. Amongst the continental varieties the *Pinus sylvestris Haguenensis*, *(Pin. de Haguenen,)* seems one of the most valuable, producing tall, straight, clean timber. The bark is of a reddish colour and remarkable for its smoothness, and its leaves, which are of a light and slightly glaucous green, are serrulated and much waved or twisted. Seeds of this kind were brought over by Mr. Loudon, and young trees reared from them are now growing and thriving in Perthshire. Young plants are also to be obtained of Mr. Lawson, nurseryman at Edinburgh.

We shall now proceed to make a few observations upon certain species of the genus *Pinus*, which, from their habit and hardy constitution, promise to thrive and attain their full dimensions in a British climate, and whose timber is of a quality likely to repay the planter, when cultivated upon an extensive scale.

The first to which we direct the attention of our readers is the *Pinus uncinata*, mentioned by Captain S. E. Cook, now Widdrington, in his "Sketches in Spain," which, though nearly allied to the *Pinus sylvestris*, and supposed by Loudon to be identical with the *Pinus sylvestris mughus* of botanists, possesses characters sufficiently marked and important to entitle it to rank as a distinct species. It is a native of the Pyrenees, inhabiting the highest zone, or line of forest vegetation, on both sides of that chain of mountains, for Captain Widdrington remarks, "though mixed at first with the *Abies (picea) pectinata*, (silver fir,) and the *Pinus sylvestris*, it gradually, as you ascend, leaves them below, and occupies exclusively the Siberian region of the high or central Pyrenees." Besides this hardiness of constitution, which points it out as a tree admirably adapted for our highland districts and lofty elevations, it possesses many other qualities which render its cultivation upon an extensive scale particularly desirable, for the same author informs us that it grows to a noble size with a bold, commanding form, and a massive foliage of a deeper green than that of *Pinus sylvestris*, so much so as to be distinguished by the Spanish woodmen by the appellation of *Pino negro*, the two varieties of the Common Pine being called the one *blanco* and the other *roxo*. Its timber is also of first-rate quality, being firm, strong, and highly resinous, and in its own country preferred to that of the *Pinus sylvestris*. Another important feature is its power of resisting storms of wind, which it does to such an extent that Captain Widdrington remarks, when speaking of the constant winds which rage in the upper regions of the Pyrenees, " In these inclement regions, where I have observed the tree in every form and situation, I never saw an instance where the wind appeared to affect it, nor where it showed a weather side." We would, therefore, recommend it to be tried, provided plants or seed can be obtained in sufficient quantity, upon elevated tracts of the Scottish highlands, or upon the mountainous districts of Wales, Cumberland, and Westmoreland.

Another species, apparently deserving of more extended cultivation, is the *Pinus laricio*, (Corsican, or Larch Pine,) which tree, though inhabiting a lower zone than the *Pinus sylvestris*, is sufficiently hardy to thrive in any part of Britain except in the more elevated mountainous regions. It is a tree of handsome form and appearance, the leaves long, slender, and of a very deep green. In Corsica it is said sometimes to attain a height of one hundred and forty to one hundred and fifty feet, but its general height may be stated at from eighty to one hundred feet. Its growth, in a favourable soil, which we consider to be a dryish, gravelly, or sandy loam, is much more rapid than that of the Scotch fir, its annual leading shoots often being upwards of two feet in length, and it is stated in the " Gardener's Magazine," that, in an instance where two plants, one of *Pinus laricio*, the other of *Pinus sylvestris*, had been planted together at the same time and at the same age, in the course of eight years *Pinus laricio* had attained a height of upwards of twelve feet, the *Pinus sylvestris* not more than seven. In France, according to Thouin, *Pinus laricio* grows two thirds faster than the Scotch Pine, placed in a similar soil and situation. As an ornamental tree it is not inferior to the Pinaster, and has the advantage over that species of always retaining an upright position and rooting itself more firmly in the ground. Its timber, also, though inferior in elasticity to that of the Common Pine, is of a quality much superior to that of the Pinaster, and by the French has been used extensively in ship-building, as well as for the masts of vessels. It is also in request with the cabinet-makers and sculptors in wood, as it works easily and smoothly under the plane and chisel. It is a native of Corsica and various other parts of Europe, and also abounds in the Caucasus and in the south of Russia. It was first introduced into England in 1759, under the name of *Pinus maritima*, having been confounded with that variety of the Pinaster now known under the title of *Pinus pinaster maritima*, and it was not until 1822 that it received its present specific name of *Pinus laricio*. The largest British specimen appears to be that growing at Kew, which is nearly ninety feet high, and at White Knights Loudon mentions one, thirty-seven years planted, as being sixty feet high.



Nearly allied to the *Pinus laricio*, of which species it is by some considered a variety, is the *Pinus pallasiana*, Lamb. It differs from that tree in having the leaves* stronger, and exhibiting a more massive foliage, of a lighter green tint. The cones are larger, being from four to five inches long, and from one inch and a half to one and three quarters broad, of an ovate oval shape, acuminate, and often slightly recurved at the extremities. The central bud is upwards of an inch long, ovate, with a sharp point, and dotted with closely adpressed, chaffy, linear-like scales.

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* The leaves on the opposite page are reduced to half their natural size.

It is described by Lambert "as a large tree, about the size of *Pinus sylvestris*, but much more spreading, sending out numerous large, declining, and horizontal branches from the summit to the base, the lower branches almost equalling the trunk in size." This description of the large size of the lower branches answers to the growth of some Pines we procured about fifteen years ago, under the name of *Pinus Tatarica* or *Taurica*, now considered synonyms of *Pinus pallasiana*. Our plants are very hardy in constitution and grow rapidly, their annual shoots being nearly two feet in length, but their growth is fastigiate and not spreading; they also establish themselves firmly in the ground, and have never suffered from our severest storms of wind or snow, and we consider it, if not as a timber tree, at least as an ornamental appendage well worthy of cultivation.

By Pallas, its wood, though knotty, is described as being very durable and full of resin.

The *Pinus Austriaca*, Austrian or Black Pine, *Pinus nigrescens* of some of the German botanists, is another species lately introduced, which promises to be a most valuable addition to our sylva. It is nearly related to *Pinus pallasiana* and *Pinus laricio*, but seems to possess characters sufficiently marked to warrant its separation from them as a botanical species. The bud is narrower than that of the *Pinus pallasiana* and coated with a white resin. It is a native of Austria, in which country it possesses an extensive range, covering, according to Captain Widdrington,* a considerable portion of the plain to the south and east of Vienna; it also clothes the lower part of the Semereng range and the hills near Baden, and ranges to the south of Styria. Loudon remarks that in the neighbourhood of the snowy mountains it grows at higher altitudes than the silver fir, and Captain Widdrington assigns it a zone immediately below that of the *Pinus sylvestris;* at the same time, he adds, "there is no question that it is sufficiently hardy to resist any cold to which it is liable to be exposed in these islands."

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* See paper "On some species of European Pine," by Captain Widdrington, R.N., in No. 49, "Annals and Magazine of Natural History."

It was first introduced into Britain by Mr. Lawson of Edinburgh, in 1835, who raised a large number of plants from seed brought from Germany, and we may here remark that plants of this species, now six years old, outstrip in strength and size those of the Common Pine placed in the same soil and situation.

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